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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/725,442	12/03/2003	M. Albert Capote	90060	5385

20529 7590 07/18/2006

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EXAMINER	
MALEVIC, DJURA	
ART UNIT	**PAPER NUMBER**
2884	

DATE MAILED: 07/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/725,442	CAPOTE ET AL.	
	Examiner	Art Unit	
	Djura Malevic	2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/21/2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/16/06,2/21/06*.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *20060526*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

The amendment filed 02/21/2006 was entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1- 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lingren et al. (5,786,597) in view of Spartiotis et al. (US Patent 5,952,646) and in further view of Capote et al. (US Patent 6,017, 634) and Su et al. (US Pub. 20030229986).

Regarding claim 1, Lingren discloses a radiation detector (Fig. 3a) comprising:

A semiconductor detector array substrate 210 comprising: CdSnTe or CdTe 212 having a plurality of detector cells; an interposer card 214 having planar dimensions no larger then the planar dimensions of the semiconductor detector array substrate; a plurality of interconnect pads on the first surface and one readout semiconductor chip with at least one connector on the second surface wherein the semiconductor chip having planar dimensions no larger than the planar dimensions of the interposer card 214. Lingren does not expressly disclose solder columns that extend from contacts on the interposers first surface

to the plurality of pads on the semiconductor detector with said columns comprising solder having a melting point less than 120 C°.

Spartiotis teaches that readout cells connected to detector cells by means of low temperature solder, preferably below 120 C° is a preferred method for merging a detector and an interposer (Col. 2, Line 15). Lingren and Spartiotis are analogous art because they are both from solder bump processes.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include a detection module merged by means of low temperature solder bumps as taught by Spartiotis in order to have, increased (high) resolution, one-to-one correspondence and that the process can be prepared at a low temperature. Note that this process also facilitates an effortless alignment, which makes ease of manufacturing as well as improved performance and reliability (Col 2, Line 39).

Further regarding claim 1, Lingren does not expressly disclose an encapsulant between said interposer surface and said detector, encapsulating said solder columns. Capote teaches that encapsulation can result in significant improvements in the fatigue life of the solder bumps as compared to an unencapsulated assembly (Col 1, Line 55) and curing temperatures below 180 C°, thus including 120 C° (Col. 4, Line 11) (Col.5, Line 61).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include an encapsulation, which includes encapsulating said solder columns at a temperature no greater

than 120 C° such as that taught by Capote in order to improve the fatigue life of the solder bumps (Col. 1, Line 55)(Col. 4, Line 11) (Col.5, Line 61).

In addition, reference Okuno et al. (US Patent 6,579,748) also teaches an encapsulating resin that cures at temperatures 100 – 150 C°.

Further regarding claim 1, Lingren does not expressly disclose a solder barrier metallization. Su teaches that typical solder bumping processes involve a protective metallurgy layer (solder barrier metallization) [0010].

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include a diffusion barrier such as that taught by Su in order to prevent the diffusion of solder into the underlying material [0010 – 0011].

Regarding claim 2, Capote discloses that the encapsulating resin comprises a cured polymer (Col. 2, Line 1).

Regarding claim 3, Lingren discloses that the contact metallization comprises gold or platinum (Col. 8, Line 44).

Regarding claim 4, Su discloses the barrier layer comprising metals selected from the list that includes Ni, Au, Ti, V, and Cu [0011].

Regarding claims 5, Lingren discloses a method for making a detector (Fig. 3a) comprising:

A semiconductor detector array substrate 210 comprising CdSnTe or CdTe 212 having a plurality of detector cell first surface, an interposer card 214 having planar dimensions no larger then planar dimensions of the semiconductor detector array substrate, a plurality of interconnect pads on a first surface, and

one readout semiconductor chip and one connector on second surface with each having planar dimensions no larger than the planar dimensions of the interposer card 214. Lingren does not expressly disclose solder bumps on the interposers' first surface to the plurality of pads on the semiconductor substrate.

Spartiotis teaches that readout cells being connected to detector cells by means of low temperature solder, preferably below 120 C° is a preferred method for merging a detector and an interposer. Lingren and Spartiotis are analogous art because they are both from solder bump processes.

It would have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include a detection module merged by means of low temperature solder bumps as taught by Spartiotis in order to have, increased (high) resolution, one-to-one correspondence and that the process can be prepared at a low temperature. Note that this process also facilitates an effortless alignment, which makes ease of manufacturing as well as improved performance and reliability (Col 2, Line 39).

Further regarding claims 5, Lingren does not expressly disclose a fluxing agent between said interposer surface and said detector. Capote teaches that a fluxing agent encapsulating the solder bumps can result in significant improvements in the fatigue life of the solder bumps (Col. 1, Line 55) and curing temperatures below 180 C°, thus including 120 C° (Col. 4, Line 11) (Col.5, Line 61).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include an encapsulation,

which includes encapsulating said solder columns at a temperature no greater than 120 C° such as that taught by Capote in order to improve the fatigue life of the solder bumps (Col. 1, Line 55)(Col. 4, Line 11) (Col.5, Line 61).
In addition, reference Okuno et al. (US Patent 6,579,748) also teaches an encapsulating resin that cures at temperatures 100 – 150 C°.

Further regarding claims 5, Lingren does not expressly disclose a solder barrier metallization. Su teaches that typical solder bumping processes involve a protective metallurgy layer (solder barrier metallization).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include a diffusion barrier (protective metallurgy layer) such as that taught by Su in order to prevent the diffusion of solder into the underlying material [0010 – 0011].

Regarding claims 6, 7 and 15-17, Lingren discloses the method for making the detector array assembly as claimed in claim 5, but does not expressly disclose solder bumps and metallized detector cell pads having melting points below 120 degrees C°. Spartiotis discloses solder bumps preferably having melting points below 120 C° (Col. 2, Line 44).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include solder bumps and metallized detector cell pads having melting points below 120 degrees C° such as that taught by Spartiotis in order to avoid the need to form bumps on both the detector and readout substrates, which provide economies of manufacture as well as improved performance and reliability (Col. 2, Line 39).

Regarding claims 8 and 9, Lingren discloses the method for making the detector array assembly as claimed in claim 5, but does not expressly disclose a polymer encapsulant resin between the two surfaces and cured at a temperature no greater than 120 C°. Capote teaches that the encapsulating resin composition (polymer) can be applied directly onto the surfaces of the devices that are joined electrically and mechanically within the claimed temperature (Col. 3, Line 5).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include disclose an encapsulant between the two surfaces and cured at a temperature no greater than 120 C° such as that taught by Capote in order to improve the fatigue life of the solder bumps (Col. 1, Line 55).

Regarding claims 10 –12, Lingren discloses the method for making the detector array assembly as claimed in claim 9, but does not expressly disclose the combined unit and encapsulating resin continues or proceeds until said encapsulating resin is fully hardened.

Capote teaches that the bumped substrate (combine unit) can be coated with the fluxing composition (encapsulate) so that it effectively fluxes the soldering of the interconnections, and then also hardens to form the solid encapsulating resin after soldering. Capote further teaches that the heat applied during the solder reflowing operation will also harden the adhesive to create high-strength bond (Col. 13, Line 41).

It would also have been obvious at the time the invention was made to a person of ordinary skill in the art to modify Lingren to include an encapsulating

resin between the two surfaces such as that taught by Capote in order to improve the fatigue life of the solder bumps (Col. 1, Line 55).

Regarding claim 13, Lingren discloses that the contact metallization comprises gold or platinum (Col. 8, Line 44).

Regarding claim 14, Su discloses the barrier layer comprising metals selected from the list that includes Ni, Au, Ti, V, and Cu [0011].

Regarding claim 18, Capote teaches said encapsulating resin at least partially cures at the same time as a process of reflowing said solder which includes prior melting point of 120 C^{o} or less (Col. 14, line39++).

Regarding claim 19, Capote teaches remelt with the prior melting point of 120 C^{o} or less to allow separation of the assembly after assembly and hardening (Col. 14, line39++).

Response to Arguments

Applicant's arguments filed 02/21/2006 have been fully considered but they are not persuasive.

With regards to claims 1 and 5, In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants is reminded that the recitation "...claimed combination of *the acrylic*..." (Page 10, Remarks) is not part of the claim language and therefore not considered by the examiner.

Additionally, applicant's suggestion that no prior art suggests an encapsulating resin curing at a temperature no greater than 120 C° and Capote '634 does not specify that the encapsulate must cure at 120 C° or less, is directed to Capote '634 (Col. 4, Line 11 – Line 24 and Col. 5, Line 64 – Col. 6, Line 12) and Okuno et al. (US Patent 6,579,748) (Col. 18, Line 45).

Capote teaches that "in absence of a catalyst, the above reaction (encapsulating resin) proceeds slowly at temperatures below about 180 C°, thus broadly speaking including 120 C° . Additionally, Capote teaches, "incorporating an acrylate and/or methacrylate in the structure can reduce the curing temperature of the adhesive polymer", thus suggesting to one skill in the art a method to reduce the curing temperature as considered necessary.

Okuno teaches an encapsulating resin curing between 100 and 150 C°, thus also teaching an encapsulating resin curing at 120 C°.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will

the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Djura Malevic whose telephone number is 571.272.5975. The examiner can normally be reached on Monday - Friday between 8:30am and 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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